

I CLAIM:

1. A coating composition comprising a film-forming component which includes
 - a) a product formed by reacting a mixture including
 - i) carboxy functional polymer, hydroxy functional polymer, or a mixture thereof, or ethylenically unsaturated monomer, and
 - ii) epoxy resin; and
 - b) a polyvinyl alcoholic-containing phenolic resol resin.
2. The composition of claim 1 wherein the carboxy functional polymer includes a copolymer of at least one ethylenically unsaturated carboxylic acid and at least one copolymerizable nonionic monomer.
3. The composition of claim 2 wherein the ethylenically unsaturated carboxylic acid is acrylic acid, methacrylic acid or a mixture thereof.
4. The composition of claim 1 wherein the carboxy functional polymer is a copolymer of acrylic acid, styrene and ethyl acrylate or a copolymer of methacrylic acid, styrene and ethyl acrylate, or a mixture thereof.
5. The composition of claim 1 wherein the carboxy functional polymer has an acid number of about 200 to about 530.
6. The composition of claim 1 wherein the carboxy functional polymer has a glass transition temperature of no more than about 110°C.
7. The composition of claim 1 wherein the carboxy functional polymer has a weight average molecular weight of about 5,000 to about 30,000.
8. The composition of claim 1 wherein the epoxy resin includes glycidyl polyether.

9. The composition of claim 8 wherein the glycidyl polyether includes glycidyl ether of dihydric phenol.
10. The composition of claim 9 wherein the glycidyl polyether is a diglycidyl ether of Bisphenol A glycidyl ether.
11. The composition of claim 1 wherein the epoxy resin has an epoxide equivalent weight of about 1,000 to about 5,000.
12. The composition of claim 1 wherein the epoxy resin is the reaction product of a mixture including aliphatic diacid, aromatic diacid, or a mixture thereof, and glycidyl ether of dihydric phenol.
13. The composition of claim 12 wherein the aliphatic diacid has no more than 8 carbon atoms.
14. The composition of claim 1 wherein the polyvinyl alcohol-containing phenolic resin is the reaction product of a mixture including:
- a) phenolic compound;
 - b) formaldehyde; and
 - c) polyvinyl alcoholic compound.
15. The composition of claim 14 wherein the phenolic is selected from the group consisting of an alkylphenol containing 7 to about 20 carbon atoms, bisphenol, and mixtures thereof.
16. The composition of claim 14 further comprising pigment.

17. The composition of claim 16 wherein the phenol includes Bisphenol A and an alkylphenol.
18. The composition of claim 17 wherein the phenol is Bisphenol A.
19. The composition of claim 18 wherein the polyvinyl alcoholic compound includes fully- or partially-hydrolyzed polyvinyl acetate.
20. The composition of claim 18 wherein the polyvinyl alcoholic compound includes fully- or partially-hydrolyzed acetals derived from polyvinyl alcohol.
21. The composition of claim 18 wherein the resol resin comprises about 1 wt. % to about 25 wt. % of the polyvinyl alcoholic compound.
22. A method of coating a metal substrate comprising:
- a) applying a coating composition of claim 1 on to at least one surface of the metal substrate to form a coating layer on the surface; and
 - b) heating the coated metal substrate such that the coating layer cures to form a cured film on the substrate surface.
23. A composite material comprising a metal substrate having at least one surface covered with a cured film, wherein the cured film is formed by:
- a) coating the substrate surface with the coating composition of claim 1; and
 - b) heating the coated metal substrate.
24. A coating composition comprising a film-forming component which includes
- a) a product formed by reacting a mixture including carboxy functional epoxy resin; and
 - b) a polyvinyl alcoholic-containing phenolic resol resin.

25. The composition of claim 24 wherein the mixture further comprises carboxy functional polymer free of epoxy functional groups.
26. The composition of claim 24 wherein the mixture further comprises epoxy resin free of carboxy functional groups.
27. The composition of claim 24 wherein the carboxy functional epoxy resin includes acid functional graft epoxy resin.

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